



Relative Age Effect: Implications for Effective Practice

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Abstract

Physical and psychological differences related to birthdate amongst athletes of the same selection year have been characterized as the 'relative age effects' (RAEs). RAEs have been identified in a variety of sports both at youth and adult level and are linked with dropout of athletes and a reduction of the talent pool. This study examined the existence, mechanisms and possible solutions to RAEs using qualitative methodology. Seven experts in the field of talent identification and development were interviewed. Inductive analysis of the data showed while there was mixed evidence for the existence of RAEs across sports, the eradication of RAEs was attributed to controllable features of the development environment. The factors reported included the structure of 'categories' used to group athletes within the sport (e.g. age, weight, size, skills), recognition and prioritization of long term development over 'short term win focus'. Education of relevant parties (e.g. coaches, scouts, clubs) about RAEs and the nature of 'talent' within a long term context was suggested, along with careful consideration of the structure of the development environment (e.g. delayed selection, provision for late developers, focus on skills not results, use of challenge). Implications for research and practice are discussed.

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Introduction

Young athletes from the same selection year can be older in comparison to their teammates by up to 12 months, with potentially even greater maturational differences. This can lead to significant cognitive, physical and emotional differences amongst athletes within the same ‘competitive’ age category (Cobley, Baker, Wattie & McKenna, 2009a). In turn, these differences (termed relative age effects – RAEs) may result in performance advantages for athletes born at certain times in the selection year. For example, the most commonly reported RAE is that ‘older athletes’ tend to be more prevalent in strength-based sports. However, research has also shown that relatively ‘younger athletes’ have performance advantages in ‘rotational or gymnastic’ type sports (Maffulli, King, & Helms, 1994). This is sometimes referred to as a ‘reverse relative age effect’. Therefore, for some sports it is an advantage to mature later than your teammates and in others earlier.

These effects have been identified in a variety of sports whereby the proportion of birth dates of the athletes that are selected is significantly skewed towards one end of the selection year (Cobley, Baker, Wattie & McKenna, 2009b; Musch & Grondin, 2001; Till *et al.*, 2010). RAEs are more likely to occur in physically demanding sports (Baxter-Jones, 1995) where athletes born early in the selection year have a physical advantage. RAEs have been reported in a variety of sports such as football in youth level (Brewer, Balsom, & Davis, 1995; Jimenez & Pain, 2008; van den Honert, 2012) and adult level in Belgium, Netherlands, France (Verhulst, 1992), Germany (Bäumler, 1998), Brazil, Australia and Japan (Musch & Hay, 1999). Additionally, RAEs have been found in ice hockey across Canada in NHL (Barnsley, Thompson, & Barnsley, 1985; Barnsley & Thompson, 1988; Boucher & Halliwell, 1991; Boucher & Mutimer, 1994), in baseball (Grondin &

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3 Joren, 2000), tennis (Bäumler, 1998; Edgar & O' Donoghue, 2005), basketball
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5 (Delorme & Raspaud, 2009), netball and cricket (O' Donoghue, Edgar, &
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7 McLaughlin, 2004).

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10 In swimming (Baxter-Jones, 1995) and volleyball (Baxter-Jones, 1995;
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12 Okazaki, Keller, Fontana, & Gallagher, 2011) RAEs seem to depend on age and the
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14 categories. RAEs were found in the age championship swimmers (11-14) but not in
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16 youth championship swimmers (14-17) (Dunman, Morris, Peyrebrune, Warr, &
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18 Nevill, 2005). In some cases RAEs were shown to disappear at adult level (Jimenez
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20 & Pain, 2008; Schorer, Cogley, Busch, Brautigam, & Baker, 2009) or even reverse.
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22 In a recent study, reversal of RAEs was found in U17 FIFA World Cup Competition
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24 in football for the Africa nation (Williams, 2010). The reversal of RAEs is when a
25
26 large portion of players within a team are born in the later part of the selection year,
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28 making them relatively younger for their selection year where originally 'normal'
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30 RAEs are observed. Bäumler (1998) in his study acknowledged that RAEs in
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32 Bundesliga (football) are decreasing as the age increases and additionally suggested
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34 that this occurred due to the decrease of the physical advantage of the players born in
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36 the first months of the selection year.
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42 Traditional methods of identifying talent seem to play a role. It has been
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44 suggested that social agents (coaches, technical directors, and parents) may influence
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46 RAEs through selection or initial enrolment (Gutierrez Diaz del Campo, Pastor
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48 Vicedo, Villora, & Contreras Jordan, 2010; Hancock *et al.*, 2013). For example,
49
50 scouts and coaches often look to select the best performers throughout the age
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52 groups, often in one off trials. Additionally, many talent identification and
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54 development models used to identify and develop talent are based mostly on
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56 anthropometric and physiological tests (Vaeyens, Lenoir, Williams, Philippaerts,
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2008). Those tests and emphasis on ‘outcome performance’ give an advantage to those adolescents who mature earlier than their teammates, because they are likely to be larger, stronger and faster, due to being ‘relatively older and/or more mature’ (Pearson, Naughton, & Torode, 2006; Reilly, Banhsbo, Franks, 2000) or have had more opportunities for practice (Côté & Abernethy, 2007; Wattie, Cobley, & Baker, 2008). Furthermore, the perception of competence and ‘potential’ play a significant role in subsequent motivation (Guillet, Sarrazin, Fontaye, & Brustad, 2006; Harter, 1978). Children that are positively affected by a relative age advantage are likely to be perceived as the most talented in their age group. The Pygmalion effect may increase the relative age advantage of those children if the behaviors of their coaches, parents and teammates continue to encourage and support the initial perception of the children’s’ abilities (Fernley, 2012; Hancock, Adler, & Côté, 2013; Rejeski, Darracott, & Hutslar, 1979). Recently, Hancock *et al.*, (2013) created a theoretical model in an attempt to explain how the Matthew effect (rich get richer; poor get poorer), the Pygmalion and the Galatea effect (self-expectations match outcomes) are manifested by athletes, coaches and parents as they link with the RAEs. Consequently, understanding RAEs is important because the occurrence of RAEs has been linked with drop out and reduced talent pool (Brewer *et al.*, 1995; Delorme, Boiché, & Raspaud, 2010; Gould & Maynard, 2009; Helsen, Starkes, & van Winckel, 1998; Verhulst, 1992).

The occurrence of RAEs is clear in the literature and so are the potential negative effects. However, there is also literature that highlights mediating factors (Wattie, Schorer & Baker, 2015). For example, popularity of a sport increases the competition for a (potentially) limited number of opportunities. This creates the circumstances that encourage the development of RAEs, particularly where

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2
3 'performance outcome' is prioritized (Musch & Grondin, 2001). Chronological age
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5 groupings and competitions from early age are considered to facilitate the
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7 development of RAEs as well (Barnsley *et al.*, 1985; Barnsley & Thompson, 1988;
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9 Helsen, van Winckel, & Williams, 2005; Jimenez & Pain, 2008; Pierson, Addona, &
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11 Yates, 2014).

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14 Interestingly, several suggestions have been made regarding the reduction or
15
16 the eradication of RAEs. Firstly, selection criteria solutions have been suggested by
17
18 researchers. A change in the age category system has been proposed, for example,
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20 15- month or a 21- month category system (Grondin, Deschaies, & Nault, 1984).
21
22 Indeed, the opportunity to practice and play with a range of older children and adults
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24 appears to be advantageous for development (Côté, Macdonald, Baker, & Abernethy,
25
26 2006). Additionally, Boucher & Halliwell (1991) proposed the idea of shortening
27
28 the selection period to 9 months. In a recent study, the dynamic model of the RAE
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30 showed that variation of the cutoff date between January 1st and July 1st annually
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32 coupled with additional support to the age disadvantaged children led to 96% s
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34 (Pierson *et al.*, 2014).
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41 Moreover, technical solutions have been proposed in order to deal with
42
43 existing RAEs. One of them is to design multiple squads based on multiple standards
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45 allowing children to have the opportunity for fair competition (Musch & Grondin,
46
47 2001). Athletes who may be technically at a high level may lack in terms of physical
48
49 development (Brewer *et al.*, 1995). Therefore, different squads would give the
50
51 opportunity to these athletes for fair competition. Finally, raising the awareness
52
53 about the RAEs is a possible approach to the problem because those who are
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55 responsible for the organization of a sport should understand the issue of RAEs and
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57 how they can affect the development of young athletes (Musch & Grondin, 2001).
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Importantly, **previous** studies examining RAEs have used a quantitative approach in order to identify the existence of RAEs. **This study is the first exploratory study of RAEs in sports using qualitative methodology. The aim of this study is** to qualitatively examine the perceptions of European based ‘talent identification and development’ (TID) experts in order to investigate the existence, mechanisms and solutions related to RAEs with more depth within a European context.

Methods

Participants

The criteria for ‘expertise’ in this study included the selection of the participants who had worked for more than 10 years professionally in TID roles such as ‘elite development’ **coaches** (Ericsson, **Krampe, & Tesch-Romer**, 1993) and working in positions with the aim to develop athletes from development to elite level (Martindale, **Collins, & Abraham**, 2007). The sample consisted of one chief executive officer of a Scottish premier league football team, one performance director of a UK national governing body, one head of senior coaching and development of a UK national governing body, a youth development coach of an U15 and U16 English premier league football youth academy, a head coach of youth swimming academy in Greece, one taekwondo instructor with a sixth-degree black belt working with developing athletes for more than ten years and finally, a coach of a national division 1 volleyball team in UK. Coaches from different sports were selected in order to give a **diverse** sample for a variety of sports **with a) well established RAEs such as football, b) with mixed findings for RAEs such as swimming and c) with no evidence of RAEs such as taekwondo.** There were six

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3 males and one female coach, five of them working within UK and two in Greece.
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5 The average years of experience of the coaches that participated in the study are 17
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7 years with minimum of 10 years and maximum of 25 years.
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10 **Design**

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12 A qualitative methodology was used in order to gain an in depth
13 understanding of the phenomenon of RAEs. A semi-structured interview consisted of
14 five main questions was used in an attempt to gain a broad understanding of RAEs in
15 participants' experience. These questions explored the existence of RAEs and how
16 this may change with age; the impact and mechanisms of RAEs; and finally, what is
17 or can be done to reduce negative impact of RAEs. The questions were open-ended
18 and chosen carefully in an attempt to draw truly open-ended responses from the
19 coaches (Patton, 1990). The researcher conducted two pilot interviews with elite
20 level coaches. The feedback from those interviews was used to evaluate and improve
21 the interview guide. Additionally, guidelines proposed by Patton (1990) were also
22 followed in order to guide the interviewer away from biasing the responses of the
23 coaches. This was facilitated by the use of neutral and impartial position when
24 probing participant responses combined with the build of rapport, comfort and open
25 responses (Backstrom & Hursch-Ceasar, 1981).
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45 **Procedures**

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47 The researcher sent a recruiting e-mail along with an information sheet to the
48 coaches that fulfilled the criteria of participating in this study. This outlined the
49 nature of the project and the issues around confidentiality and anonymization of data.
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51 Consent form was gained from those participants who volunteered prior to the
52 interviews. The main interview questions were sent to the coaches prior the
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3 interview in order to enable them familiarize with the type of the questions of the
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5 interview. **Participants need time to consider their responses and this technique has**
6
7 **been suggested to provide more thick and rich data from the participants (Burke &**
8
9 **Miller, 2001).** The interviews were chosen to be conducted through telephone or
10
11 Skype. The interviews lasted approximately 60 minutes and were recorded and
12
13 transcribed verbatim. So as to ensure the in depth investigation into coaches'
14
15 perceptions of RAEs, each coach was asked the same sequence of questions,
16
17 although further clarification and probing was used as required for each coach
18
19 (Patton, 1990).
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23 **Data Analysis**

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26 Analysis was conducted according to the procedures described by Edwards,
27
28 **Kingston, Hardy, & Gould,** (2002) using only inductive analysis. The inductive
29
30 method was adopted for this study including 1) coding experience 2) inductive
31
32 inference and 3) similarity processes (Côté, **Salmela, Trudel, Baria, & Russell,**
33
34 1993). The results were sent back to the coaches in order to ascertain credibility of
35
36 the findings through stakeholder checks (Patton, 1990). Moreover, reliability checks
37
38 were carryout in collaboration with other members of the **research** team (Scanlan,
39
40 **Ravizza, & Stein,** 1989). This procedure included the coding of raw data quotes into
41
42 raw data themes in 10% of the interviews, followed by matching all the sub- themes
43
44 to the general-dimension themes. **Two members of the research team conducted the**
45
46 **coding independently. They discussed and reviewed their analysis until they reached**
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48 **to 100% agreement.** Finally, according to the grounded theory memos were written
49
50 in order to capture the thought processes of the researcher and facilitate the best
51
52 possible analysis of the data (Gucciardi, **Gordon, Dimmock, & Mallett,** 2009).
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Results

After the analysis of the data several themes emerged from the inductive analysis which are part of the following section (Williams, 2010). In order to enable the reader gain a better understanding of the context in which the themes emerged from the data quotes are used in the following section of the study.

RAEs and Implications for Effective Practice

Evidence of relative age effects and reversal of relative age effects.

RAEs were reported in football, volleyball and cricket while no RAEs were found for taekwondo, swimming and skiing, finding that supports the existing literature. One of the participants gave statistics about the occurrence of RAEs in a football premier league academy and also described the reversal of RAEs for the same team. Interestingly, it seems that despite the fact that elite youth academies in football have a biased selection with the majority of the players born early in the selection year those who actually progress to elite senior/adult level are born late in the selection year. Despite the fact that no RAEs were reported for taekwondo a case of reverse RAE was identified from one of the participants.

We looked at 2000 players to select 40 of them which was the advanced group and from that 40 we signed 18 for the U19 which is a process that happens every year. Out of those 2000 players the 78% were born in the first four months of the year.

Participant 7

From my experience in football, *English Premier League football academy 2010* had 150 boys of which 26 were born in the second, third and fourth quarter. That meant 124 were born in the first quarter of the year. 10 players were on loan that year; all ten were from the fourth quarter. Those boys on loan were 18, 19 and 20. The academy is up to 18, so the best players that kept on by *English Premier League football academy* were all from the fourth quarter.

Participant 2

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6 My sibling is born on November and is world champion [taekwondo], my
7 sibling is born October and is a European champion [taekwondo], I am born
8 on September and I am world champion [taekwondo].
9

10 Participant 4
11

12 **Advantages and disadvantages of RAEs.**

13 *Physical and mental advantages of being relatively older.* The findings of
14 *this study supports* that more *maturely developed* children have physical and mental
15 advantages that can facilitate RAEs. Those differences are more likely to occur
16 during puberty because of the great maturation differences during these periods.
17 Especially in young ages a few months difference could create major physical and
18 mental differences which can cause RAEs. More mature young athletes are likely to
19 be taller and heavier which increase their chances of being picked up for a team.
20 Consequently, the physical and mental advantages of relatively older athletes can
21 create RAEs especially in strength-related sports. Furthermore, almost a year of
22 additional training and playing time might be the cause of RAEs amongst youth
23 teams since sport specific abilities can be rapidly improved especially in young ages.
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40 I would say between the ages of 13 to 16[RAEs are likely to occur]. I would
41 say just before high peak velocity with boys. Girls maybe a little bit earlier.
42 The growth pace of these young children is enormous.
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45 Participant 6
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47 I believe that mental and physical skills [developmental advantages] play a
48 significant role in developing this difference [RAEs] between the children.
49

50 Participant 3
51

52
53 I was playing at the national volleyball team under 12 and I believe that the
54 most important reason for that was because I was born on February which
55 gave me the opportunity to have one year more of training.
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57 Participant 3
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6 *RAEs facilitate skewed learning opportunities particularly when there is a*
7
8 *'win focus'.*
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11 Athletes who have this advantage are likely to be picked for their teams
12 especially when teams focus on winning instead of long-term development.
13 Therefore, the extra playing time plus the advanced coaching or more focused
14 coaching can enhance their initial advantage which essentially facilitate and
15 exacerbate the RAEs impact.
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23 Always players born as much as possible closer to the cut-off date receive
24 more attention and will have the advantage of improving due to this attention
25 that they get from the coaches. Therefore it will always be unfair for those
26 who are born later in the selection year because they will not have the same
27 opportunities.
28

29 Participant 3
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31
32 A number of participants highlighted that the priority of the coaches or scouts
33 is crucial. For example, coaches or scouts who are intentionally or unintentionally
34 selecting, and providing opportunities and attention only to the 'best performers' are
35 likely to be reinforcing RAEs and missing young players with potential who may be
36 relatively younger. Physical advantages in young ages do not necessarily mean that
37 technical aspects of an athlete are higher in comparison to other teammates.
38 However, taking into account the additional playing time for those 'advantaged'
39 youngsters and the attention from the coaches their initial physical advantages leads
40 to advantages in others aspects of the sport. Long-term development instead of
41 winning focus was highlighted from the participants as a necessary shift towards the
42 eradication of RAEs. A prerequisite for this to happen is the education of coaches
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3 and scouts regarding RAEs in youth sports and in general the fundamentals of talent
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5 identification and development.
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8 I know a lot of coaches that because they want to win they will choose the
9 child who is stronger who is quicker than a child who may show some talent
10 but is a little bit smaller.
11

12 Participant 6

13
14 Each club has scouts and the scouts go out and the scouts pick the players.
15 The scouts have very little education; there is no qualification to scouts in
16 talent recruitment in football. They go out and often they look to the player
17 that has the biggest impact in the game. Therefore, to an uneducated eye
18 those are the ones that are the best players.
19

20 Participant 7

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23 *RAEs provide useful challenge for ‘younger’ athletes who ‘get in to the*
24 *system’.*
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28 Through the interviews it was identified that relatively younger and smaller
29 players (who get into the system) face numerous additional challenges through the
30 development process that can facilitate their development and mental toughness in
31 the long term. One of participants stated that those athletes are more likely to
32 progress because of the challenging environment. More specifically, he described
33 that being less mature or less developed in comparison to other athletes (opponents
34 and teammates) may affect positively the personal development of an athlete. This
35 was highlighted in the case of the English Premier League academy in which from
36 all the academy players only those born in the first months of the selection actually
37 made it to the senior level gaining a contract with their team. Being less mature or
38 ‘smaller’ forces an athlete to be creative, solve problems and be perseverant in
39 order to deal with adversities at all times. This process is possible to develop the
40 psychological characteristics that have been identified to be essential for elite level.
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As such, incorporating challenge and psychological skills development in a more

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3 wide spread systematic way is likely to yield advantages for all athletes as opposed
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5 to leaving it as a 'consequence' of RAEs.
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8 If you are a smaller player you have to be a problem solver, you are also
9 suffering because you are not getting success all the time. Therefore, you
10 have to deal with adversity as well and all of them are really important traits
11 for a top athlete later on. So imagine you are a problem solver, you deal with
12 diversity and you have unbelievable perseverance that's why you stayed in
13 the program this long because other kids that were small just dropped out. So
14 if you do stick with them and you have strong will as a coach and you
15 encourage them the results can be enormous.
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18 Participant 7
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23 **Eradication of RAEs attributed to controllable factors.**

24 *Sport structure categories.*

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29 Where coaches reported a lack of RAEs (swimming, taekwondo and skiing),
30 it was attributed to the structure within the respect sports. The examples in this study
31 show that extended age categories (2 years), weight categories and a skills points
32 system (e.g., skiing FIS points) help to eradicate RAEs. However, in the literature it
33 has been identified that the existence of RAEs in swimming depend on the age
34 categories and it is present in some of them. Weight categories in taekwondo and
35 other sports eradicate RAEs because the division criteria are based on weight which
36 ensures fair competition between athletes with similar weight. In alpine skiing FIS
37 points in combination with race results based on month of birth enabled the
38 reduction of RAEs.
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52 No, I don't believe that those effects exist in swimming because age
53 categories are divided every two years.
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55 Participant 1

56 I believe that the birth dates has no influence on athletes because of the
57 structure of the [weight] categories in taekwondo.
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Participant 4

We have an alpine selection in alpine skiing based on race results and FIS points. There is a quite nice assessment based on race performance results. They happen in 16, 16 and a half, 17, 17 and a half. So we are able to plot a boy or girl results based on the month of birth against the month of birth of the top ten best performers in the main Olympic podium of that same year of birth, or month. So down to the month for Alpine.

Participant 2

In line with this, different division criteria were suggested by the coaches and more specifically division by size or skills. These suggestions would give the opportunity to youngsters to compete with similarly developed athletes in terms of maturation and skills. In sports that strength and size are important dividing teams based on size could offer fair competition for young athletes by creating a challenging environment for the more mature athletes and allowing space for the late developers to participate and get playing time. Regarding sports that strength and size are not substantial training and competing with teammates and opponents within a similar range of skills can be really helpful for the development of athletes and it can be achieved by dividing the athletes in groups based on their skills.

The groups of athletes can be divided not by chronological age but by size especially in sports like volleyball and basketball.

Participant 3

Your skills profile will decide in which group you will get trained or coached.

Participant 2

Moreover, a variety of division strategies were proposed: division in 4 quarters, division every 6 months, 2 years age bands). Shorter period division may eliminate maturation differences while age bands have the potential to allow late developers to keep up and give the opportunity to quick developers to progress to the next age band.

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3 Another strategy that I have seen is to divide the year in four quarters like
4 *English Premier Football Club* does and then train and coach the players
5 based on the four quarters rather than based on one year group.
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7 Participant 2

8
9 Divide a selection year in two parts, every 6 months instead of 12 could be
10 another solution.
11

12 Participant 3

13
14 I would suggest age bands. For example if there are 9s and 10s you would
15 have 9 years old and 10 years old playing together which mean that if you are
16 9 years old you will have two years playing in that particular age band so if
17 you are a late developer you will have two years in this age band to hopefully
18 catch up. Any kids who are quick developers they can move from one age
19 band to the next age band.
20

21 Participant 5

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23
24 ***Long term priority: focus on skills not results.***

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26 The participants suggested that a focus on skills (physical and mental) instead
27 of outcome results would contribute to the eradication of RAEs. However, this relies
28 on the sport prioritizing long-term development over age group success. **One of the**
29 **participants suggested that mental skills are a key characteristic that help athletes**
30 **during their athletic career and underpins “realizing potential”.** Developing the
31 **mental side of athletes or in other words developing an athlete as a person is a crucial**
32 **element for their successful long-term development.**
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43 On other sports we were able to eradicate it because we are looking at skills.
44 We are not looking at the ability to win competitions...I would say more
45 mental skills because mental skills are what we get people to demonstrate
46 [*because mental skills underpin long term development*].
47

48 Participant 2

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51 ***Delay selection & provide for late developers.***

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53 It was highlighted that the ignorance of ‘late developers’ may strengthen
54 RAEs. By only providing early windows of opportunity for selection, athletes who
55 may have great potential may be missed if they are ‘young for their year’ or not the
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3 'best performers' at early stages. Taking into consideration that some characteristics
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5 need several years to emerge late developers should not be neglected because they
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7 may reach their best potential later than their teammates. Therefore, those athletes
8
9 need to be supported and be given the opportunity to participate and compete.
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12 It is extremely bad practice for a development environment or a development
13
14 pathway not to acknowledge late developers because I think there is a
15
16 possibility you close the door on a number of individuals who could
17
18 participate in a sport because of this negative effect of not being chosen and
19
20 just been ignored because they haven't developed in the same level.

21 Participant 6

22 One of the participants emphasized the importance of the timing of the
23
24 selection process. Early selection creates 'rejection' and narrows the potential talent
25
26 base. By giving athletes time and allowing them to develop it is more likely to avoid
27
28 drop out and in the same allow space for late developers. Reducing the talent pool
29
30 reduces subsequently the chances of producing great elite athletes. In addition to this,
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32 performances at youth competitions are not a guarantee for later success at senior
33
34 level. Rejecting a youngster may drive him/her to disengagement from sport which is
35
36 a negative outcome for both the athletes and the society as a whole.
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39 I think we need to take more kids and I think that we need to make the
40
41 selection later on. I think we select the players far too early and players feel
42
43 rejected far too early.

44 Participant 7

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46 ***The need for education.***
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49 Participants suggested that a helpful step would be to educate coaches/scouts
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51 and any other relevant parties where necessary with regards to RAEs and also what
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53 'talent' is within a long term perspective. For example, what are the possible effect
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55 of birthdates and the different levels of maturation? What are the pros and cons of
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57 different category strategies and/or later selection processes? What are the priorities
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2
3 for the coaches/scouts/clubs? Education of coaches and scouts involved in youth age
4
5 groups is of paramount importance because they have a substantial impact on the
6
7 future of the young athletes. Thus, coaches and scouts need to be educated not only
8
9 regarding RAEs but also ‘‘what talent is’’ as one of the participants described. It is
10
11 necessary to be clear for the scouts/ coaches which are the elements they should look
12
13 for and which are the skills they should focus on developing.
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16
17 Coaches need to be educated on the effect of age and the effect of children
18
19 developing at different levels, at different rate of maturity and understanding
20
21 that they could have kids who are beyond their years or under their years in
22
23 terms of development and how to deal with that and the potential effect.

24
25 Participant 6

26
27 We need to improve the education of scouts. I think the education of scouts is
28
29 of paramount importance. They are the people that are going out and bring
30
31 the players to the clubs and they have to know what talent is.

32
33 Participant 7

34 35 Discussion

36
37 The findings of this study are in line with previous literature showing that
38
39 maturation and physical differences may create RAEs (Baxter-Jones, 1995; Maffulli
40
41 *et al.*, 1994) especially in strength related sports such as football (Jimenez & Pain,
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43 2008; van den Honert, 2012), volleyball (Baxter-Jones, 1995; Okazaki *et al.*, 2011),
44
45 and cricket (O’ Donoghue *et al.*, 2004). Additionally, no RAEs were described by
46
47 the participants for swimming taekwondo and skiing. This study supported earlier
48
49 research which has confirmed that certain division strategies have eradicated RAEs.
50
51 This finding was attributed to the different division strategies used in those sports.
52
53 For instance, no RAEs were identified amongst Olympic taekwondo athletes
54
55 (Albuquerque, Lage, & Teoldo da Costa, 2012); finding which is in line with
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1
2
3 research showed that weight categories prevented the development of RAEs
4
5 (Delorme, 2014). Regarding skiing, one of the participants suggested that FIS points
6
7 are able to eradicate RAEs, although in a recent study RAEs were found in skiing for
8
9 both males and females (Baker, Janning, Wong, Cobley & Schorer, 2014). In
10
11 addition, this research supports previous work that highlights increased opportunities
12
13 and attention is often given to relatively older athletes because they are better
14
15 performers (Musch & Grondin, 2001; Wilson, Cushion, & Stephens, 2006). For
16
17 example, in a recent study with hockey players attending a selection camp it was
18
19 found that the players selected for the final team were taller, heavier and the majority
20
21 of them were born between January to June (Sherar, Baxter-Jones, Faulkner, &
22
23 Russell, 2007), despite the fact that the coaches were aware that their future potential
24
25 in terms of physical development were the same. Likewise, Till *et al.*, (2010) showed
26
27 that anthropometric and physical variables are not a predictor of performance at the
28
29 elite level. This finding reinforces the fact that late developers should not be
30
31 neglected at early stages of the development pathway. It has been identified that
32
33 systems should be in place in order to help athletes with potential that may have been
34
35 overlooked by an early selection (Abbott, Button, Pepping, & Collins, 2005;
36
37 Martindale *et al.*, 2007). It should also be taken into consideration that some
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39 characteristics of talent may need several years to emerge (Simonton, 1999).
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46 Moreover, this study gave evidence of reversal of RAEs at an elite level
47
48 football academy and in taekwondo. Reversal of RAEs is the appearance of a large
49
50 portion of players (within a team) born towards the last part of the selection year,
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52 making them relatively younger for their selection year and then reach the elite level.
53
54 Reversal of RAEs has been described in the literature in football (Bäumler, 1998;
55
56 Williams, 2010) and shooting sports (Delorme & Raspaud, 2009). Relatively
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1
2
3 younger athletes can be facilitated by the continuous challenges and develop the
4
5 toolbox of essential skills that is required for competing at elite senior level.
6
7 Interestingly, this is one explanation that has been given for the development of
8
9 reversal of RAEs, whereby those younger athletes who do ‘make it into the system’
10
11 have to overcome the challenge of performing against older, more mature opponents
12
13 on a regular basis (Collins & MacNamara, 2012). Therefore, implementing
14
15 ‘structured’ challenge along with psychological skills development in a systematic
16
17 way is likely to be beneficial for all athletes (Alfermann & Stambulova, 2007; Bull,
18
19 Shambrook, James, & Brooks, 2005; Collins & MacNamara, 2012; Gould,
20
21 Dieffenbach, & Moffett, 2002; MacNamara & Collins, 2010; MacNamara, Button, &
22
23 Collins, 2010). Additionally, one of the participants suggested that mental skills are a
24
25 key characteristic that help athletes progress during their athletic career (MacNamara
26
27 & Collins, 2010; MacNamara *et al.*, 2010) in the long- term (Henriksen, 2010;
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29 Martindale *et al.*, 2007). Therefore, mental skills should be identified, promoted and
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31 developed throughout the athletic career.
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39 Similarly to previous research participants suggested a shorter period division
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41 of 9 months (Boucher & Halliwell, 1991) in order to reduce maturation differences.
42
43 They also proposed age bands of 15 to 21 months (Grondin *et al.*, 1984) in an
44
45 attempt to give time to late developers to flourish and allow to the progressed
46
47 athletes move to next age band. Another division strategy suggested in this study is
48
49 division by skills which has been suggested in the literature (Baxter-Jones, 1985).
50
51 However, dividing young athletes according to their skills could increase the injury
52
53 risk during a collision (Wattie, 2013). Côté and his colleagues (2006) suggested that
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55 the environment of smaller cities is conducive to unstructured play between different
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ages and allow experimentation which is possible to facilitate the development of athletes towards elite level.

Furthermore, the majority of the coaches emphasized on the need for education and long-term priority. They suggested that education is essential for scouts and coaches since in some cases they perceive physical maturity as talent (Sherar *et al.*, 2007; Till *et al.*, 2011). Moreover, the participants proposed that there is a need to focus on developing skills instead of winning. Essentially, prioritization of long term development instead of transient results was highlighted by the participants; suggestions that fit well with guidelines for effective talent development environments (Martindale *et al.*, 2007). However, there is pressure from coaches and teams for results in young ages and in general success at youth age groups. Consequently, the philosophy of the current system as a whole needs to be aligned with its aims (Pankhurst & Collins, 2013).

Conclusion

This study explored the existence, mechanisms and solutions that may exist with regards to RAEs within a European context. There were mixed results with regards to its existence, with some evidence for reversal of RAEs. The participants gave some evidence for reversal of RAEs. In those sports where RAEs did not exist, it was attributed to controllable factors such as the structure of the categories used to group the athletes (e.g., expanded age, weight, or skill categories) and/or prioritizing long term development. Furthermore, it seemed clear that the need to understand the nature of 'talent' and its development within a long term perspective is needed

(Henriksen, 2010; MacNamara & Collins, 2010; MacNamara *et al.*, 2010; Martindale *et al.*, 2007). In short, when a ‘win or outcome focus’ is paramount at developmental ages, those with maturation/performance advantages inevitably get prioritized, at the expense of other relatively younger peers. Interestingly, it was reported that those ‘relatively younger’ athletes who were able to ‘access the system’ benefited from the developmental challenge of having to train and compete with older and/or bigger peers on a regular basis. However, as previous research has highlighted, ‘challenge’ can facilitate the development of athletes in their best potential (Bull *et al.*, 2005; Gould *et al.*, 2002). Moreover, a recent study suggested that ‘structured challenge’ can be implemented more systematically to aid development in all athletes, and doesn’t have to be reserved as an ad hoc consequence of RAEs (Collins & MacNamara, 2012). Leading on from this, it appears that the priorities and planning of coaches, scouts, National Governing Bodies and clubs needs to revolve around long term development if the RAE and related negative consequences are to be eradicated.

It is important to highlight both limitations and strengths of this exploratory study. Firstly, the number of coaches involved in this study was small (N=7). However, to provide some context to this number, the selection of the participants was made carefully and based on specific criteria in an attempt to access opinions and experiences of those we termed applied ‘experts’ within the field of TID. Even so, more in depth investigation within in specific sports, including investigating the experiences of other relevant parties such as parents and athletes would add value to this area of research.

This study gave further insight to the issue of RAEs in sports. However, there is a need of further research of this phenomenon, particularly in relation to understanding

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2
3 the mechanisms of the RAE and examining the efficacy of different strategies in
4
5 eradicating it. Further examination will allow us to design and implicate potential
6
7 solutions in practice. The RAE is an issue that needs to be addressed because it is
8
9 vital for young children to have equal opportunities for participation and
10
11 development in their best potential within sport.
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